

Closing Food Gaps

A country will be faced with growing food insecurity when food supplies are nutritionally inadequate and/or do not keep pace with population growth. Projections are made assuming trends in the key factors affecting food security—agricultural productivity, foreign exchange availability, and population growth—continue. Any change in the performance of these factors could significantly alter the projection results (fig. 4). We used a projections model to simulate the effect of changes in these factors. For example, to estimate the feasibility of closing food gaps by increasing crop yields, we assumed fertilizer use to increase at a higher rate than that of the baseline projections; we then compared the effect on per capita consumption with the baseline results.

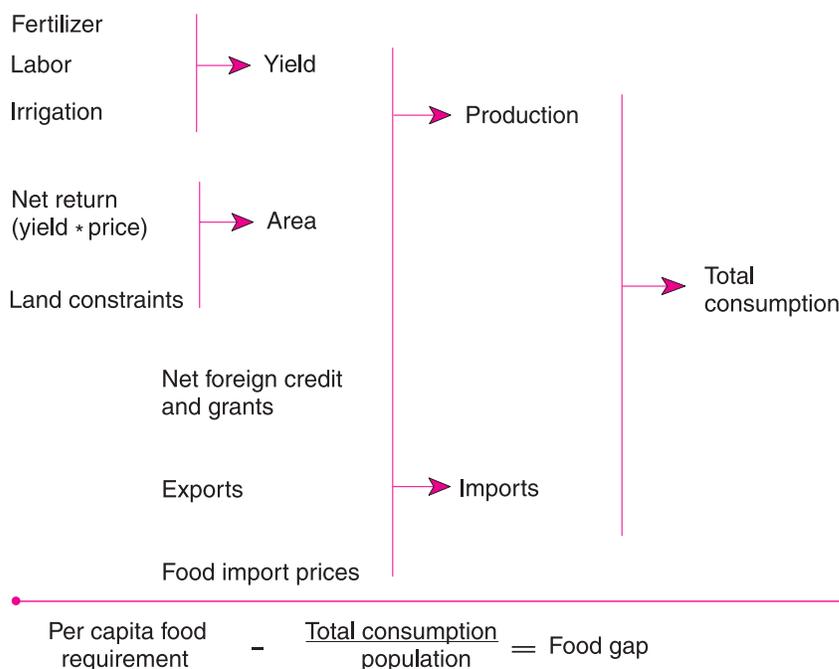
Increasing Production

Agricultural productivity is, generally, the essential element of the food security equation. In food-insecure countries, growth in food production is usually low, and, in many cases, population growth is high,

putting additional pressure on food demand. The annual production growth rate required to close the average nutrition food gap by 2008 ranges from 3.4 percent in Sub-Saharan Africa to 1.4 percent in North Africa (fig. 5). The questions are: can past success be repeated or failures avoided? what would be the source of growth? Surprisingly, for the 66 countries studied, the average annual growth in food production was about 3 percent during 1980-97, more than their average population growth of 2.3 percent for the same period. Most of the food production growth, however, was concentrated in a handful of countries.

For example, Egypt showed an impressive production growth rate following the adoption of a new wheat variety that led to more than a 60-percent increase in grain yields between 1980 and 1997. In Nigeria, grain production increased nearly 7 percent annually, and production of root crops grew 10 percent per year during 1980-97. Nigeria's continued restrictions on food imports have increased domestic prices, thereby raising the incentives to produce. Nigerian farmers adopted a

Figure 4
Factors affecting food consumption and food gaps



new variety of cassava, and increased their average yield threefold. Because of Nigeria's size relative to other countries in the region, its strong growth supported Sub-Saharan Africa's food output growth at 3.6 percent per year during 1980-97. In fact, if Nigeria is excluded from the Sub-Saharan statistics, the annual growth rate of food production in the region would have been only 2 percent per year, which is lower than the region's 3-percent-per-year increase in population.

In Asia, average food production grew 2.6 percent per year during 1980-97, which roughly translates into a 0.5-percent-per-year increase per capita. Food production growth in the LAC countries increased only 1.2 percent per year, considerably less than their 2.2-percent population growth. In the NIS countries, production has stagnated since 1987, the first year data were available.

Future production growth in the countries depends on expanding crop area, improving productivity of the existing lands, or both.

Expanding Crop Area

Since many low-income countries, particularly in Sub-Saharan Africa and LAC, have not experienced improvements in technology, most increases in agricultural output have stemmed from area expansion (1,12). In Sub-Saharan Africa, area expansion measured more than 2 percent per year during 1980-97. However, the long-term prospects for acreage expansion are not bright, because, in most countries, a large part of land that could be used for farming is unfit to cultivate without major investment. In LAC and Sub-Saharan Africa, continued expansion of cropland means converting range and forest land to crop production, a process with high economic and environmental costs. According to FAO estimates, about half of the land that could be used to produce food in Sub-Saharan Africa has poor soil (12). Sub-Saharan Africa has a vast and diverse land area, but the region faces a number of resource constraints (such as lack of water) to sustainable agricultural growth (6). Some countries, such as Sudan and Zaire, have vast areas of rainfed land with crop potential, while others, such as Kenya and Madagascar, have already exhausted their high-potential land. In addition, relative to land currently in production, much of the potential cropland is distant from domestic and foreign markets. Moreover, the transport and communications infrastructure necessary

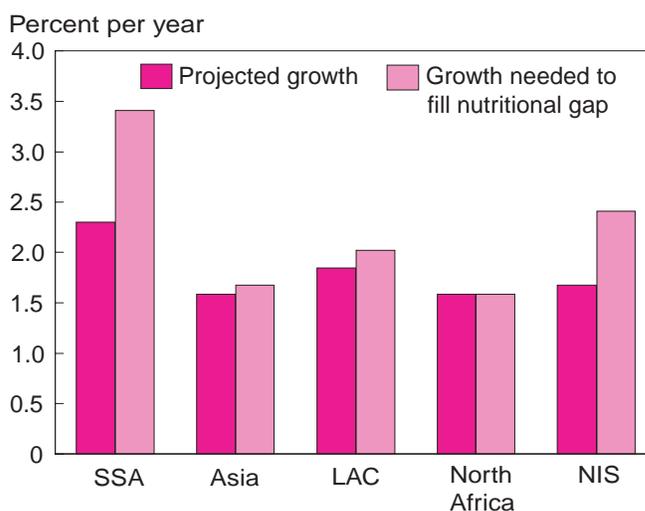
for trade between the areas of crop potential and markets is poorly developed.

Demographic changes are placing increasing pressure on land in Sub-Saharan Africa. More than 20 percent of all vegetative land is degraded due to human causes; however, water and wind erosion still account for a majority of the affected hectares. Much of this degraded area is in the Sahel, Sudan, Ethiopia, Somalia, Kenya, and southern Africa. Historically, farmers adjusted to resource constraints by following several years of planting with several fallow years. However, population pressures have reduced the practice of these sustainable agricultural techniques, and are leading to rapid declines in land productivity.

Growth in Yields

The only option to sustain production growth is to increase yields. Growth in yields is projected to match or exceed 1980-97 levels in LAC, Sub-Saharan Africa, and the NIS. These optimistic trends are attributed to the improved government policies of recent years which are expected to increase returns and provide better incentives to producers. In North Africa, growth of grain yields is projected to be slower than during 1980-97 because no major technological shift, similar to the early 1990's adoption of high-yielding varieties in Egypt, is expected in the future (12). Grain yields in Asia are projected to follow the recent trend (since the

Figure 5
Projected growth in food production, 1998-2008
Production growth needed to close the nutrition gap in Sub-Saharan Africa far exceeds projected rates.



mid-1990's), which is slower than the growth of the last two decades. In LAC and Sub-Saharan Africa, while yield growth is projected to at least match that of 1980-97, it falls short of the growth required to significantly improve food security. Sub-Saharan Africa's annual yield growth would need to accelerate to 2.2 percent from projected rates of 1.4 percent to eliminate the nutrition food gap by 2008. In LAC, yield growth would need to increase 1.5 percent per year, or three times the historical rate (table 4).

Average regional grain yields are the highest in North Africa, followed by Asia, the NIS, LAC, and Sub-Saharan Africa (fig. 6). The quality of resources and use of new technology are the reasons behind this ranking. During 1980-97, yields declined in the NIS countries and increased only marginally in LAC. In Sub-Saharan Africa, yields grew 1.4 percent per year. Distorted policies, limited resources, low input use, and little use of new technology are the principal factors constraining yields in many countries in these regions. Despite constraints, Asia and North Africa experienced relatively strong yield growth of 2.6 and 3.5 percent per year during 1980-97. In Egypt, the combination of fertile land and the adoption of high-yielding crop varieties boosted the country's yields significantly in the early 1990's, thereby raising the average regional yields. During the 1970's, most of Asia's production gains stemmed from the use of "Green

Revolution" technology and crop varieties, expansion in the land base through irrigation, as well as improved cultivation practices. Use of improved inputs also contributed to yield growth. Farmers who adopt improved crop varieties must use more fertilizer and timely water application and drainage to achieve yield potential. In Asia, many governments made a package of

Table 4—Grain yield growth by region

*Yield growth must accelerate to eliminate the nutrition gap in most regions.**

Regions	1980-97	1998-2008	Growth to fill gap
<i>Percent per year</i>			
North Africa	3.5	1.5	0.8
Sub-Saharan Africa	1.4	1.4	2.2
Asia	2.6	1.3	1.4
LAC	0.5	0.9	1.5
NIS	NA	1.0	1.7

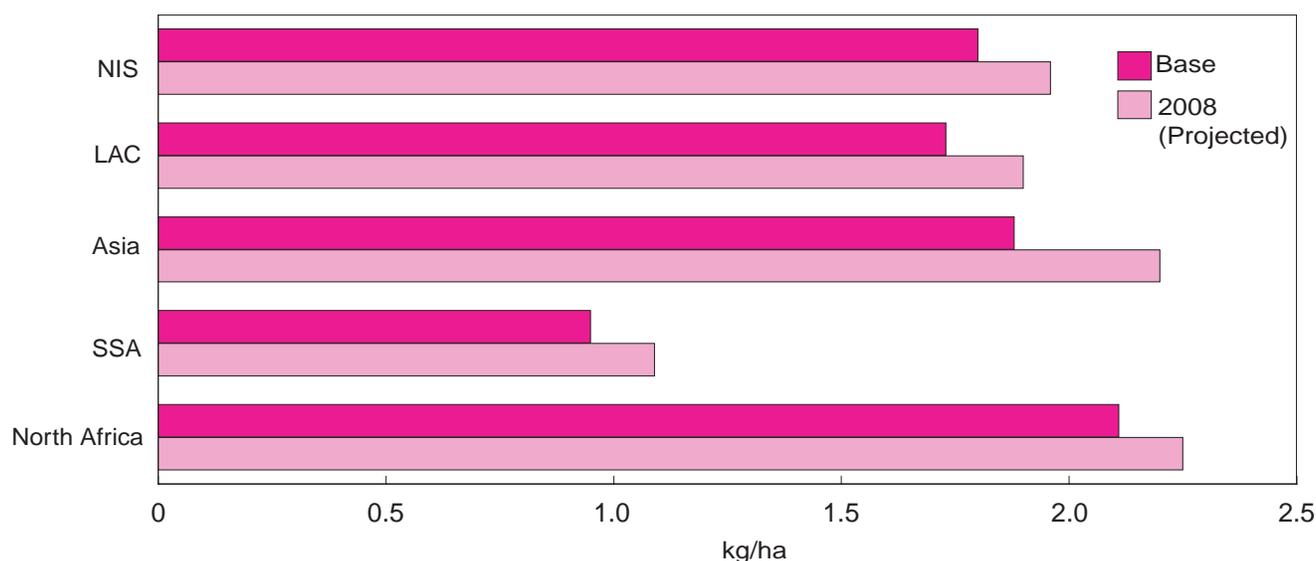
NA = not available.

* Given projected import growth.

Figure 6

Grain yields by region

Average grain yields are influenced by quality of resources and use of technology.



technologies (high-yielding varieties, adequate fertilizer, and chemicals) available to farmers. In countries with limited support for inputs, the adoption rate was very slow. The pace of yield growth, however, has slowed during the last decade and the current slower trend is expected to continue.

Yield projections are based on the use of improved inputs, particularly fertilizer use. The Asian countries use the most fertilizer, 95 kg per hectare, followed by LAC at 76 kg, North Africa at 74 kg, and Sub-Saharan Africa at a very low level of 7 kg. Sub-Saharan Africa accounts for only 1 percent of the world's fertilizer use. This study assumes higher fertilizer applications for yield projections in all regions. But yield does not increase proportionally to increases in fertilizer use. In this study, a 1-percent increase in fertilizer use is projected to result in a 0.1–0.3 percent increase in yield (estimates based on cross country data of the 66 countries) (2,6). Because of such low responsiveness, growth rates of fertilizer use are projected to be low—in the range of 1 to 4 percent annually. In Sub-Saharan Africa, growth is projected to be positive, reversing the trend during 1980-97. Despite this assumption of growth, fertilizer use per hectare will remain low by world standards, rising to only 9 kg by 2008. Because of Sub-Saharan Africa's low response of yields to fertilizer use, this increase will translate into only a small gain in yields—6 percent in 10 years.

The principal factor limiting yield response to fertilizer use is the inadequate supply of water during the growing season. Although water availability varies considerably across the regions, it has become a serious problem in many countries. According to the World Bank study "Resources and Global Food Prospects," depletion and degradation of water resources are major problems facing many low-income countries (4,5). Within 10 years, if population grows at projected rates, per capita water availability will decrease by an average of 20 percent in developing countries and 34 percent in African countries. The agricultural sector consumes over half the annual freshwater withdrawals in most of the countries and could face greater competing demands from household and industrial uses in the future.

The sparse rainfall that characterizes much of Sub-Saharan Africa affects fertilizer response and demand (5,9). Farmers are very reluctant to risk fertilizer use until rain falls, since without adequate moisture to dissolve nutrients in fertilizer (especially nitrogen), crops

can "burn." Irrigation can make the use of fertilizer profitable and increase agricultural output. However, in Sub-Saharan Africa, only 4.3 percent of arable land is irrigated. This is low, even when compared with other developing regions. In LAC, 13 percent of arable land is irrigated, and 38 percent is irrigated in Asia (13). The world average is 19 percent. There is potential for expanding irrigated area in Sub-Saharan Africa, but it is costly and requires investment. Increasing the use of fertilizer raises production costs. In many low-income countries, particularly those in Sub-Saharan Africa and LAC, almost all fertilizer is imported, and the lack of adequate foreign exchange constrains availability.

The effects of technical change, improvements in infrastructure, and research on yield growth are difficult to quantify. A paper by USDA economists summarizing earlier studies on agricultural productivity in Sub-Saharan Africa indicates that policy reform, improvement in infrastructure, and research expenditures encourage adoption of yield-increasing technologies (16). In recent years, however, public spending on these activities has declined in most countries. This trend could have detrimental implications for increasing food production.

Increasing Imports

The performance of domestic production would be less critical to food security if countries could import their required foods. Financial constraints are important factors limiting the role of imports in many countries. In some regions, the size of the food gaps are quite small relative to commercial imports, meaning that if imports grew at a slightly higher rate than projected, the gaps could close. This is the case in North Africa and LAC. In Asia, the ratio of the nutrition gap to commercial imports is projected to be more imposing, however, at 20 percent in 2008. In Sub-Saharan Africa, the ratio of the average nutrition gap to commercial imports is projected at 229 percent. Given the region's prospects for slow import growth, it is highly unlikely that the gap will be filled by expanding imports. To close nutrition gaps, food imports must grow nearly 13 percent per year in Sub-Saharan Africa, 5.6 percent in the NIS, 4.7 percent in Asia, and just under 4 percent in LAC (table 5). The North African countries do not have any nutrition gaps, but to maintain their consumption, food imports need to grow nearly 3 percent per year. Given the import patterns of

the regions during 1980-97, the most difficult challenge is the significant import growth required in Sub-Saharan Africa.

The outlook for the financial conditions of most of the study countries permits only slow growth in food imports. During 1980-97, food imports expanded in all regions. Asian imports increased at the fastest rate, nearly 8 percent per year (13). Sub-Saharan Africa's imports grew at the slowest rate, 1.9 percent. The positive import growth was a response to a combination of factors: declining world food prices, slow domestic production growth (particularly in Sub-Saharan Africa and LAC), improvements in financial conditions (in North Africa and Asia), and the relaxation of import restriction policies in many countries.

Food imports are supported by foreign exchange availability. Foreign exchange availability, in this study, is defined as the sum of real export earnings and real net external financial flows. The response of food imports to foreign exchange availability is not one-to-one in this study (inelastic response in the range of 0.6 to 0.8, depending on the country—estimates based on cross country data). This means that, everything being equal, to achieve a 1-percent growth in food imports, foreign exchange availability must grow by 1.3 to 1.7 percent. Export earnings growth is projected to be

Table 5—Food import growth

*Food import growth must accelerate to close nutrition gaps.**

Regions	1980-97	1998-2008	Growth to fill gap
<i>Percent per year</i>			
North Africa	3.7	2.6	2.6
Sub-Saharan Africa	1.9	1.9	12.7
Asia	7.7	3.1	4.7
LAC	5.9	3.4	3.8
NIS	NA	3.2	5.6

NA = not available.

* Given projected production growth.

positive in all regions, while the real net external financial flow (credit and external assistance) is assumed to remain constant at 1995-97 levels. This projection assumes that performance of exports will be the key determinant of food imports. For example, to achieve the target import growth, Sub-Saharan Africa's export earnings must increase by 13 to 17 percent annually.

While Sub-Saharan Africa's projected growth rate for exports is almost double the growth experienced during 1980-97, it falls well short of the growth required to fill the food gaps. Continued political instability in Liberia, the Congo, Central African Republic, Sudan, Somalia, Rwanda, Burundi, and Angola dampens the region's prospects for export growth. In addition, Sub-Saharan Africa continues to depend on the exports of a few primary commodities—such as coffee, tea, sugar, and tobacco—for most of its export earnings. Prices for these commodities are projected to decline in the long term. According to the World Bank, in real terms, non-energy and agricultural commodity prices are projected to decline on average by nearly 2 percent per year in 1997-2006, metals by 1.8 percent, and beverages by 3.5 percent (19). Internal market conditions (demand, supply) of Sub-Saharan countries generally have no significant influence on world market prices. Therefore, their export earnings are influenced by world commodity prices and shifts in foreign demand. Consequently, lower commodity prices will limit export earnings, and thereby limit imports, which will ultimately increase the region's vulnerability with respect to food security.

Any significant increase in the net external financial flows to these countries is unlikely. Average net flows of money to the regions of North Africa, Sub-Saharan Africa, and LAC declined during the last decade, while the flow to the Asian countries in this study grew less than 1 percent per year (19). External credit and assistance has contributed roughly 10 to 15 percent of the total annual value of imports of the countries during the last decade, although there is a wide variation among countries. For countries such as Mozambique, as much as 75 percent of imports were supported by external assistance in the last 5 years, while countries with political problems, such as Algeria, are faced with a net loss due to capital flight. For a number of countries, the debt burden continues to dampen growth prospects and the risks of setbacks are considerable;

therefore, financial conditions remain difficult. According to the World Bank, the ratio of debt to exports exceeded 200 percent in the low- and middle-income countries of Sub-Saharan Africa, LAC, and South Asia in 1995 (19).

To deal with the financial squeeze, many countries have responded by taking economic or political steps to help provide a more financially stable future. These programs emphasize currency devaluation, privatization, and reduction in market distortions. They are also expected to promote export performance, but it is not clear how much these policies will influence the amount of foreign capital these countries receive. The annual growth of earnings from exports (which is deflated by 2.5 percent, the World Bank's projected inflation rate in the countries designated by the Organization of Economic Cooperation and Development) is projected to be highest in the Asian countries, at 6 percent, and the lowest in Sub-Saharan Africa, at 1.5 percent (19).

Reducing Population Growth

High population growth rates are the principal factors stimulating food demand. The United Nations projects a declining trend in population growth, but at varied rates across regions. The highest rate of decline is projected for North Africa, where during 1980-97, popula-

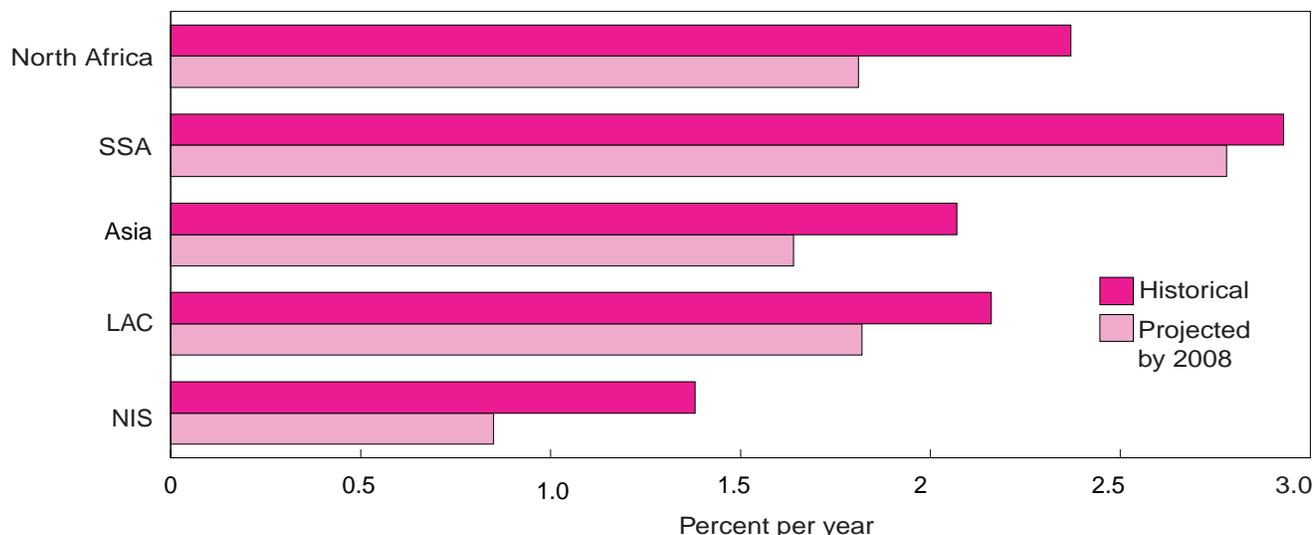
tion growth was 2.4 percent and is projected to slow to 1.7 percent by 2008 (fig. 7). The smallest decline is expected in Sub-Saharan Africa where the growth of 3 percent per year during 1980-97 is projected to decline to 2.7 percent during 1998-2008. If population growth in this region were to decline to 2.3 percent, the projected growth in domestic food production would be adequate to eliminate the nutrition gap.

Sub-Saharan Africa's population more than doubled to an estimated 527 million between 1960 and 1990, and by the year 2008 it will approach 800 million. There is little doubt that prolonged rapid population growth, in the absence of subsequent increases in agricultural investment and sustainable cultivation methods, causes bleak prospects for most countries in Sub-Saharan Africa. The decision to reduce family size, however, will not happen automatically. A large number of factors such as agrarian structure, stagnant rural incomes, and religious and cultural beliefs are believed to be important determinants of a family's demand for children in the region (8,10). With the exception of successful family planning initiatives in Botswana, Kenya, and Zimbabwe, there is no indication of a sustained decline in Sub-Saharan Africa's population growth rate. The present age composition will also lead to continued high population growth. Between 35 and 50 percent of the region's population is 15 years old or younger. With such a large percentage of the region's

Figure 7

Population growth rates

Population growth rates are projected to slow.



inhabitants about to enter their reproductive years, population growth likely will remain high even if average fertility rates decline.

The extensive food production systems common in Sub-Saharan countries create a strong incentive for large families, because the ability to increase cultivated area increases with family size. Family size is even more important because most of the food-production work is done by women and children. Until the time that an additional child becomes more expensive than the income and labor that the child contributes, households will have few incentives to restrict family size. Therefore, to reduce population growth, governments need to curb incentives for large families by promoting technology as a means of raising agricultural productivity. This would be achieved through investments in

market infrastructure as well as research and extension. If new agricultural technologies are not adopted, labor will remain the principal input in production, and large families will be the norm. Such a scenario would continue the trend of little or no growth in per capita food supplies, stagnant or deteriorating caloric intake, and declining nutritional status (2).

In many parts of Sub-Saharan Africa, population pressure has forced people in traditional agriculture to work harder without being able to maintain their incomes or their standard of living—measured in terms of food consumption and production. Ill health caused by malnutrition, unexpected illness, disease, and accidents hinders a country's development potential and traps it in a cycle of rapid population growth, falling per capita food production, and insufficient health care.